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trate the anatomy and embryology of echinoderms, it is hardly possible to have given less characteristic illustrations of their structure and development than those selected by Mr. Bather in his introductory chapter on the "Echinoderma."

Mr. Bather has a very extensive and accurate knowledge of the crinoids, and he has given an excellent account of the group, but it is entirely out of proportion to the very moderate one given of the holothurians, starfishes, and Echinoidea. One need only compare Zittel's account of the Echinoidea and Crinoidea with those of Mr. Bather and of Mr. Gregory to see how far Mr. Gregory's account of the Echinoidea falls short of Zittel's admirable presentation of the history of the order.

The authors unite the ophiurans with the starfishes; in this they certainly will not receive the assent of writers on echinoderms, nor is their association of the holothurians, starfishes, and Echinoidea as "Eleutherozoa" in contrast to the Pelmatozoa likely to be accepted.

The student of zoölogy is certainly entitled to a better account of the holothurians than that given by Mr. Goodrich. With the superb figures of Semper, Theel, Ludwig, Semon, and many others available, such figures as are given on pages 218, 219, 222, and 223 are hardly creditable in what is intended to be an important text-book.

The figures as a whole vary greatly in quality; many of the outline cuts of the crinoids and the analyses of the plates are coarse. The figures of the few fossil Echini given are poor, and a large number of the illustrations which accompany the starfishes and ophiurans are not even good as diagrammatic sketches.

The palæontology of the echinoderms is not to be compared with that of Zittel and of Neumayer, and the volume bears too plainly the mark of having been written by palæontologists and not by morphologists familiar at first hand with the structure and development of echinoderms.

Notes. — Students of earthworms will be interested in the results of Michaelsen's recent studies of Kinberg's types of Oligochæta (*Ofversigt k. Vet. Akad. Forhandl. Stockholm*, Bd. LVI, 1900). The only species from the United States included is *Pherctima californica*, which is shown to include two species of Amyntas, *A. californica* and *A. indica*.

In the Stockholm Academy's *Proceedings* (Vol. LVII, No. 1, p. 13) Dr. Einar Lönnberg gives an account of the observations of Professor von Grimm and himself on the fauna of the Caspian. Species of

Gobius, Benthrophilus, and Syngnalhus were obtained, together with numerous Crustacea, many Mollusca, a few worms, and some algæ.

A study of the genera Hygroceleuthus and Dolichopus has led Melander and Brues (*Biol. Bull.*, Vol. I, p. 123) to place all flies belonging to the former genus under Dolichopus, though the species thus transferred form a natural group of less than generic value. In their revision of this genus the authors describe thirteen new species.

The structures which have been described by previous writers as the rudimentary dental ridges in embryo birds have been reinvestigated by H. D. Tjeenk Willink (*Tijdschr. d. Ned. Dierk. Ver.* (2), Bd. VI (1900), pp. 243–254, Taf. XI). These structures are easily identifiable in many species of birds, but are too well developed to be called rudimentary. If they are the remains of dental ridges, which the author believes is by no means certain, they have most assuredly assumed secondary functions and contribute materially to the formation of the horny bill. This function in itself is a sufficient explanation of their presence, without assuming that they are the remains of dental ridges.

Vanhöffen (*Zool. Anzeiger*, Bd. XXIII (1900), pp. 277–279) has investigated the finer structure of three genera of deep-sea medusæ, Atolla, Periphylla, and Periphyllopsis, on material all of which was collected from a greater depth than 600 meters. Both Haeckel and Maas believed that the deep-sea medusæ possessed, in addition to statocysts, eyes of a simple type. Vanhöffen finds no evidence of eyes in the material studied by him and believes that Haeckel mistook pigmented entoderm for eyes, and that Maas was in error because of imperfectly preserved specimens.

Bittacomorpha clavipes Fabr., a near relative of the crane flies, is characterized by having enormously swollen metatarsi on all its legs. Brues (*Biol. Bull.*, Vol. I (1900), pp. 155–160) has found that an enlarged tracheal tube occupies almost the entire cavity of the swollen metatarsus. As this insect flies poorly, the author believes that the balloon-like enlargements of its metatarsi enable it to be wafted easily by currents of air. The coloration of these parts gives the animal, when suspended in air, a striking resemblance to drifting thistle seeds.

The third number of Vol. I of the *Biological Bulletin* contains the following papers: "The Early Cleavage and Formation of the Mesoderm of Serpulorbis squamigerus Carpenter," by S. J. Holmes; "New

Species of Hygroceleuthus and Dolichopus," with remarks on Hygroceleuthus by A. L. Melander and C. T. Brues; "On the Origin of the Sperm Blastophore of Some Aquatic Oligochæta," by S. Hatai; "Peculiar Tracheal Dilatations in Bittacomorpha clavipes Fabr.," by C. T. Brues; and "Lampreys in Captivity," by A. M. Reese.

BOTANY.

Alternation of Generations in Algæ.[1] — The author has made a careful study of the European forms of the Cutleriaceæ, a small but interesting group of algæ, and the results are given in this paper of one hundred pages. Two genera have been known in European waters, Zanardinia and Cutleria, the former represented by a single species, *Z. collaris*, the latter by two, *C. multifida* and *C. adspersa*. Each is represented by a sexual and an asexual form, in Zanardinia indistinguishable in habit, but in Cutleria so different that the asexual form was long known as a separate genus, Aglaozonia.

The paper begins with a thorough résumé of the previous investigations by Thuret, Reinke, Falkenberg, Janczewski, Kuckuck, and Church, which showed Aglaozonia to be included in the Cutleria cycle of development, assigning to *C. multifida*, *A. parvula*, and to *C. adspersa*, *A. chilosa*. The author has discovered a new form, *A. melanoidea*, occurring in the Mediterranean and on the Atlantic coast of Morocco, thus giving three sexual to two asexual forms. Though absolute proof has not been obtained, the author seems justified in regarding the new form as connected with *C. adspersa*, the sexual form corresponding to *A. chilosa* being yet to be discovered. As the asexual form of *C. multifida* has a farther range northward than the sexual form, it is not improbable that the sexual form of *A. chilosa* may be some little known tropical or subtropical species.

In studying the fertilization and development of Cutleria we find a curious complexity. The sexual form is diœcious; in many localities only the female plant is known, propagating freely by parthenogenesis; in some localities male plants are extremely rare; in others they occur in equal numbers with the female, or are even twice as common; but in only one place have cultures shown fecundation of the oöspore. In the locality where the male plant is most abundant

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[1] Sauvageau, Camille. Les Cutlériacées et leur alternance de Générations, *Ann. Sci. Nat.*, Ser. 8, Botany, vol. x, pp. 265–362.